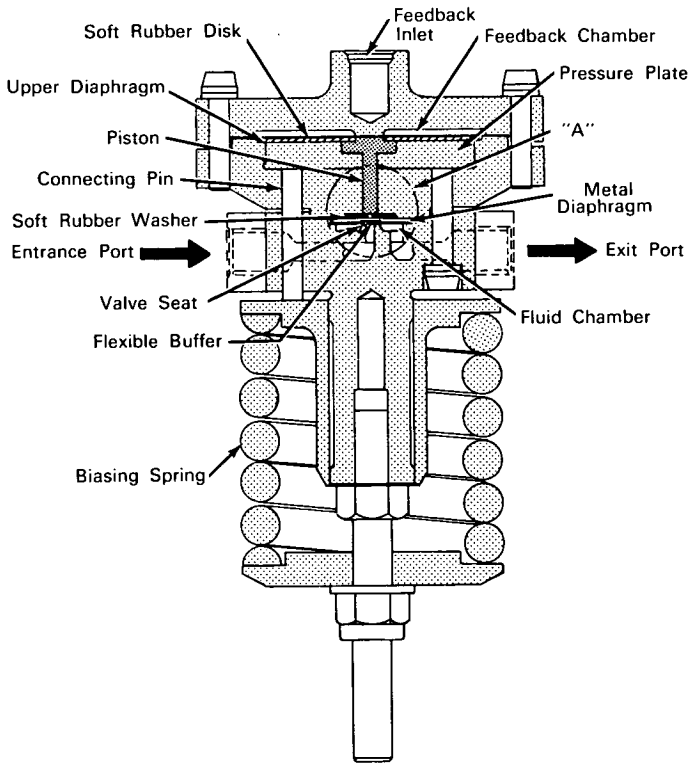
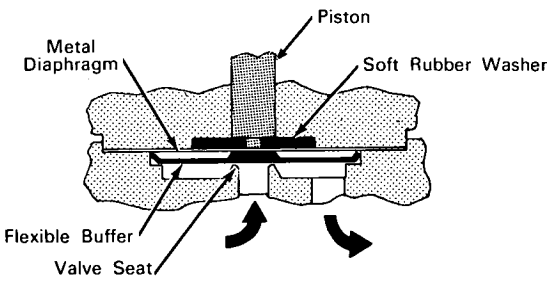
NASA TECH BRIEF

Improved Fluid Control Valve Extends Diaphragm Life





DETAIL "A" (VALVE OPEN)

The problem: Increasing the wear resistance of flexible diaphragms in fluid control valves. Diaphragms used in such valves are subject to excessive flexure and early rupture from stresses produced by contact with the piston and edges of the valve seat.

The solution: A valve incorporating a soft rubber washer at the bottom of the piston to reduce flexural stresses on a thin metal diaphragm; a flexible buffer between the diaphragm and edges of the valve seat to prevent the edges from cutting into the diaphragm; and a fluid feedback arrangement which overcomes the bias of a spring and allows a small force to close the valve when cutoff pressure is reached.

How it's done: The thin metal diaphragm seals the fluid chamber from the upper portion of the valve when the valve is either opened or closed. When the valve is opened the flexible buffer is away from the valve seat. Fluid passing into the entrance port flows around the valve seat into the fluid chamber and out through the exit port. In the closed condition, the piston and soft rubber washer push against the diaphragm and flex it downward against the buffer,

(continued overleaf)

which in turn pushes against the valve seat to prevent the flow of fluid into the fluid chamber and connecting exit port.

The large biasing spring acting against the pressure plate and the section of the piston within the plate keeps the valve normally opened. When the feedback pressure above this plate reaches the cutoff value, the force exerted by this pressure on the large upper surface of the plate overcomes the biasing force of the spring and moves the plate downward, leaving the piston free to move downward and close the valve. Since the area of the top of the piston is small compared to the area of the pressure plate, the closure force due to the pressure on the top of the piston is also small. With these improvements, the bias-spring characteristics are less critical and the stress and wear of the components at the valve seat are minimized.

Note: A related innovation is described in NASA Tech Brief B64-10278 dated November 1964. Inquiries may also be directed to:

Technology Utilization Officer
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California, 91103
Reference: B65-10147

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546

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